Modifiers of Modal Auxiliaries: New Sources for Ordering

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Modifiers of modal auxiliaries (MMAs) like *easily*,[1] which seem to have the effect of strengthening or intensifying a modal, have not yet been given a compositional account.

(1) a. The vase could easily fall. $\rightarrow$ The vase could fall.
b. The vase could fall. $\nrightarrow$ The vase could easily fall.

Recent work has shown that at least some modals, like *likely*, are gradable (Yalcin 2007, 2010; Lassiter 2011; Klecha 2012), requiring a modal semantics which is compatible with a Kennedy-style semantics for gradability (Kennedy 1999, 2007; Kennedy and McNally 2005), which allows for the combination of gradable modals with degree modifiers like *more*, *too*, *very*, etc. Lassiter (2011) argues in light of this that all modals, even modal auxiliaries, are inherently scalar; so this raises the possibility that *easily* is like a degree modifier. But *could* cannot combine with degree modifiers more generally, and *easily* does not combine with anything other than modal auxiliaries. Yalcin (2007) argues for a mixed account where some modals are gradable and some have a traditional quantificational semantics; moreover, Klecha (2012a, in progress) specifically rebuts Lassiter, arguing that modal auxiliaries may have a Kratzerian quantificational semantics.

I propose a semantics for *easily* which allows for it to act as a "possibility intensifier" but without abandoning a Kratzerian semantics for possibility modals, as Lassiter (2011) does. Rather, *easily* restricts the domain of the modal, giving a stronger interpretation.

1 Compositional Ingredients

1.1 The Measure Function A first cut analysis might be that *easily* is an overt ordering source, which provides a more restrictive ordering. The modal *could* then takes the best of the worlds in the modal base as determined by this ordering to return a more exclusive modal domain (say, only highly probable or stereotypical worlds). A classical view of *could* is in (2), where m is a modal base and g an ordering source.

(2) $[\![\text{could}]\!] = \lambda\phi[\lambda m[\lambda g[\lambda w[\exists v \in \text{BEST}_{g(w)}(\cap m(w))[\phi(v)]]]]]$

However, *easily* is itself gradable, calling into question the superlative aspect of (2):

(3) a. The vase very easily could have fallen.
b. The piggy bank fell, but the vase just as easily could have fallen.

[1] Note that this is not the same *easily* as in (i), which could be paraphrased as "with ease"; this use of *easily* requires an agentive verb, which is not present in (1).

(i) a. He could easily lift it over his head. $\leftrightarrow$ He could lift it over his head with ease.
b. The vase could easily fall. $\nleftrightarrow$ #The vase could fall with ease.

An ordering source is a set of propositions from which the modal determines an ordering and narrows its domain. However, Klecha (2012a, in progress) argues that degree modification is the primary diagnostic for gradability, i.e., type $\langle \alpha, \langle s, d \rangle \rangle$; so given that *easily* combines with degree modifiers, *easily* must denote a measure function rather than an ordering source. I argue that *easily* denotes such a function ranking worlds by their stereotypicality given an evaluation world. Thus it is of type $\langle s, \langle s, d \rangle \rangle$.

(4) $[\![\text{easily}]\!] = \lambda v[\lambda w[\textsc{stereotypicality}(v)(w)]]$

1.2 Degree Modification I take degree modifiers to have the type $\langle \langle \alpha, \langle s, d \rangle \rangle, \langle \alpha, \langle s, t \rangle \rangle \rangle$, where α is a variable over types, which is already needed to account for adjective type variability. The same degree modifiers can combine with gradable properties of individuals (5), as well as gradable properties of events (6).

(5) $[\![\text{tall}]\!]^g = \lambda x_e[\lambda w[\text{height}(x)(w))]]$
$[\![\text{just as}_7]\!]^g = \lambda G_{\langle \alpha, \langle s,d \rangle \rangle}[\lambda x_\alpha[\lambda w[G(x)(w) = g(7)]]]$
$[\![\text{just as}_7 \text{ tall}]\!]^g = \lambda x_e[\lambda w[\text{height}(x)(w) = g(7)]]$

(6) $[\![\text{early}]\!]^g = \lambda x_\epsilon[\lambda w[\text{earliness}(x)(w)]]$
$[\![\text{just as}_7]\!]^g = \lambda G_{\langle \alpha, \langle s,d \rangle \rangle}[\lambda x_\alpha[\lambda w[G(x)(w) = g(7)]]]$
$[\![\text{just as}_7 \text{ early}]\!]^g = \lambda x_\epsilon[\lambda w[\text{earliness}(x)(w) = g(7)]]$

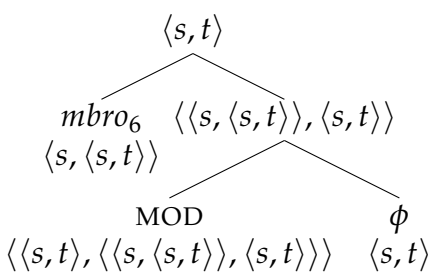
This means that *easily* too can combine with degree modifiers, as well as with the positive morpheme (*pos*), which relates the target to a standard relative to an anaphorically introduced comparison class (Kennedy 2007).

(7) $[\![\text{easily}]\!]^g = \lambda v[\lambda w[\textsc{stereotypicality}(v)(w)]]$
$[\![\text{just as}_7]\!]^g = \lambda G_{\langle \alpha, \langle s,d \rangle \rangle}[\lambda x_\alpha[\lambda w[G(x)(w) = g(7)]]]$
$[\![\text{just as}_7 \text{ easily}]\!]^g = \lambda v[\lambda w[\textsc{st}(v)(w) = g(7)]]$

(8) $[\![\text{easily}]\!]^g = \lambda v[\lambda w[\textsc{st}(v)(w)]]$
$[\![pos_8]\!]^g = \lambda G_{\langle \alpha, \langle s,d \rangle \rangle}[\lambda x_\alpha[\lambda w[G(x)(w) \succeq s(G)(g(8))(w)]]]$
$[\![pos_8 \text{ easily}]\!]^g = \lambda v[\lambda w[\textsc{st}(v)(w) \succeq s(\textsc{st})(g(8))(w)]]$

1.3 The Modal and Its Base Contrary to the usual analysis, I assume that modals do not combine directly with the modal base, rather, with a 'modal base pronoun' (henceforth *mbro*) which denotes an accessibility relation determined from an anaphoric modal base. Also contrary to much literature, I argue that *could* does not have an ordering source (more on this below).

(9) $[\![mbro_6]\!]^g = \lambda v[\lambda w[v \in \cap g(6)(w)]]$
$[\![\text{could}]\!]^g = \lambda \phi_{\langle s,t \rangle}[\lambda m_{\langle s,\langle s,t \rangle \rangle}[\lambda w[\exists v \in m(w)[\phi(v)]]]]$
$[\![mbro_6 \text{ could } \phi]\!]^g = \lambda w[\exists v \in \cap g(6)(w)[\phi(v)]]$



2 Putting the Ingredients Together

2.1 Modification The MMA *easily* attaches as the sister of *mbro*. As both are of type $\langle s, \langle s, t\rangle\rangle$, I assume they combine via a generalized Predicate Modification rule (10), giving the derivation in (11).

(10) **Generalized Predicate Modification** If a node α has two daughters, β and γ, both of type $\langle \tau, \langle s, t\rangle\rangle$, then let $[\![\alpha]\!] = \lambda x_\tau[\lambda w[[\![\beta]\!](x)(w) \,\&\, [\![\gamma]\!](x)(w)]]$

(11)
$[\![\text{the vase fall}]\!]^g = \lambda w[\text{tvf}(w)]$ LEX

$[\![\text{could}]\!]^g = \lambda\phi_{\langle s,t\rangle}[\lambda m_{\langle s,\langle s,t\rangle\rangle}[\lambda w[\exists v \in m(w)[\phi(v)]]]]$ LEX

$[\![\text{could the vase fall}]\!]^g = \lambda m_{\langle s,\langle s,t\rangle\rangle}[\lambda w[\exists v \in m(w)[\text{tvf}(v)]]]$ FA

$[\![mbro_6]\!]^g = \lambda v[\lambda w[v \in \cap g(6)(w)]]$ LEX

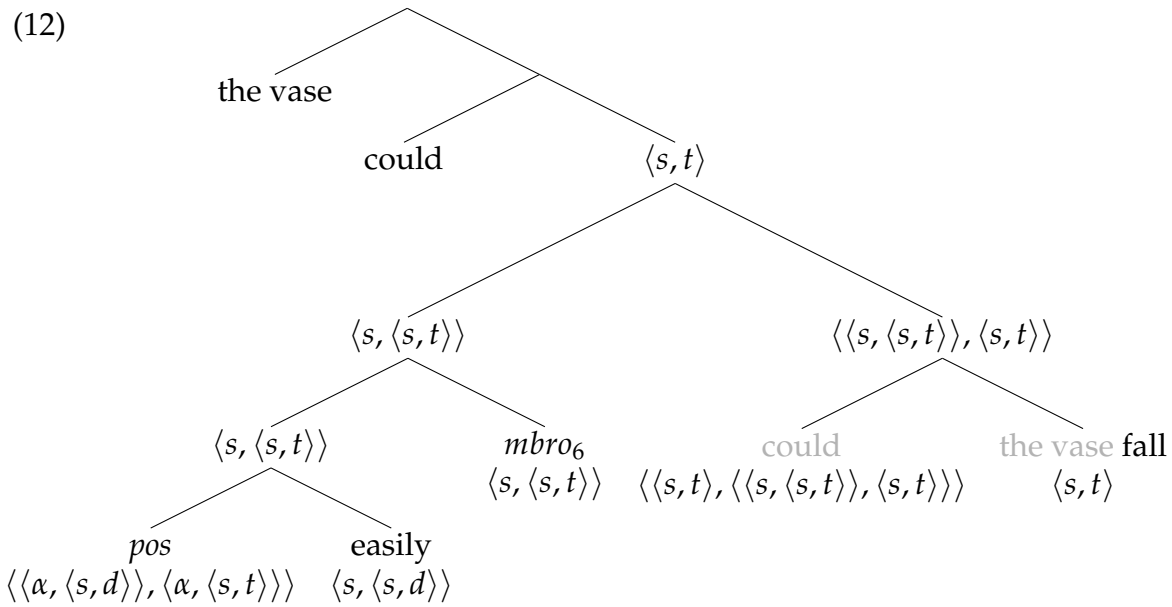
$[\![pos_8 \text{ easily}]\!]^g = \lambda v[\lambda w[\text{ST}(v)(w) \succeq s(\text{ST})(g(8))(w)]]$ (8)

$[\![pos_8 \text{ easily } mbro_6]\!]^g = \lambda v[\lambda w[\text{ST}(v)(w) \succeq s(\text{ST})(g(8))(w) \,\&\, v \in \cap g(6)(w)]]$ GPM

$[\![pos_8 \text{ easily } mbro_6 \text{ could the vase fall}]\!]^g =$
$\lambda w[\exists v[\text{ST}(v)(w) \succeq s(\text{ST})(g(8))(w) \,\&\, v \in \cap g(6)(w) \,\&\, \text{tvf}(v)]]$ FA

Surface word order is derived by subject movement from Spec vP to Spec TP and head movement from a v projection to T; I assume neither has any (relevant) semantic effect.

(12)



2.2 Conditionals A daredevil has just walked across a tightrope. I say to her:

(13) If a strong gust of wind had come along, you could easily have fallen.

If the antecedent is unlikely; i.e., there are no stereotypical worlds with a strong gust, it looks like this gives us an empty modal base and fails to derive the right meaning. In fact, the original lexicalized superlative semantics for ordering sources was formulated to get

around this very problem (Lewis 1973, Kratzer 1981, 2012). But recall that *pos* crucially determines a standard of comparison contextually (Kennedy 2007). As with attributive adjectives, the comparison class may come from its sister:

(14) That is a tall {boy/man/skyscraper}.

Likewise, the standard of stereotypicality used by *pos easily* is relativized to which worlds are in the modal domain denoted by *mbro*. This fixes our problem and provides an intriguing alternate strategy for dealing with problems that the original formulation of the ordering source was meant to solve, which should be addressed in future research.

2.3 Domain Restriction The MMA *easily* has the effect of restricting the domain to more stereotypical worlds. But if *could* already has an ordering source, this effect is trivial. Thus, I argue *could* has no lexical ordering source.[2] This raises the question of how outlandish worlds can be excluded from the domain of (bare) *could*.

Klecha (2012b, in progress) argues that exclusion of outlandish worlds is due to imprecision, a pragmatic effect. This is because the exclusion of these worlds is defeasible, whereas with *easily*, it is not.

(15) *A man walks along a tightrope between two buildings, secured by a safety line*
   a. You could have fallen to your death!
   b. No, I couldn't have – I had a safety line which was tested right beforehand.
   c. Yes, but the safety line could have broken in some unforseen way!

(16) *A man walks along a tightrope between two buildings, secured by a safety line*
   a. You could easily have fallen to your death!
   b. No, I couldn't have – I had a safety line which was tested right beforehand.
   c. #Yes, but the safety line could have broken in some unforseen way!

Thus the restricting effect of *easily* is semantic; the effect seen in bare *could* is pragmatic.

3 Conclusion This abstract outlines a theory of modal modifiers of auxiliaries, which have not been given a serious compositional analysis, and shows a new way to determine contextually sensitive modal domains using the positive morpheme.

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[2]This should not be construed as an argument against ordering sources generally; just in this case.